

CREATIVITY AND SCIENCE

Autor: Paolo Manzelli. Director of Educational Research Laboratory.

Dirección: Laboratorio Ricerca Educativa. Dip. Chimica. Università Firenze. Sede Internazionale Scientifica. Istituto ECO-CREA. Sede: Via Maragliano, 77 (I) 50144 Firenze.

Creativity is the basic principle for the improvement of personal intelligence and for progress of society. It is one of the fundamental strategies of natural evolution.

Every system no matter how complex develops itself by means of transformation or achieves natural evolution by means of mutations. There is no scientific definition of creativity because science has not developed a complete interpretation of systems transformation for understanding the evolution in nature. Therefore, at present, system science needs to conceptualise creativity as a natural strategy for transforming evolutive development. From our point of view this means that we should be able to establish a new paradigm for addressing global issues to understand creativity as an expression of system evolution in nature. We can symbolise this new *paradigm* as, <E/I/M> and include the notion of «Information» among the general fundamental variables that science needs for the general description of energy and matter systems interactions.

To answer the question, «How many conceptual variables do we need for a global description of nature?», Einstein considers «hidden» variables.

In attempting to understand such problems, we think of people's brain as part of nature. For a general description of system theory, we need to accept that an explanation of natural phenomena, including brain functioning, can be defined in relation to the two traditional parameters Energy (E), and Matter (M) and a third conceptual parameter, Information (I). <E/I/M> paradigm is our concept which inserts the thinking brain into the physical reality and is to be considered a «global system paradigm»; i.e. a concep-

tual context in which the meaning of physical objectivity is extended to include the subject that is observing and interpreting the reality, into the global objective interpretation of systems science. Using this meaning we can develop the <E/I/M> paradigm of system science understanding that includes the person and his/her creative thoughts as an objective part of natural evolution. The <E/I/M> paradigm allows us to integrate into global theory Natural and Educational Systems evolution. Including the brain of the observer into the generalized concept of objective reality enables us to refer not only to the external world with its traditional paradigm of «mechanical» science, but to the new scheme of the cognitive reality of the world construction of the brain.

Using the <E/I/M> paradigm we can look at the knowledge of the entire universe as a generalised system of learning that evolves by means of creativity. We apply this method of thinking to the fundamental postulate that energy cannot be created or destroyed. A logical consequent of this postulate is that the total energy must be a constant equal to say One at any time. If we consider the information as a parameter of the general description of the energy-matter transformation (inclusive of brain interactive function), the global variation, (d), of the different aspects of energy, obtained from the sum of the free-energy, (Ef), and the codified-energy (i.e. Matter-E_m) and also E_i, then the energy dissipated into the information process of the brain understanding must be equal to zero. (A derivative of a constant is zero).

$$E \text{ total} = [(E_f) + (E_m) + E_i] = 1$$

i.e. at any time

$$d[(E_f) + (E_m) + E_i] = 0$$

$$\text{Hence } d(E_i) = -d(E_f) - d(E_m) \dots (1)$$

Hence the evolution can be seen as a program in which nature progressively transforms Energy and Matter interactions to develop an increase of energy linked to the processes of information, (E_i) .

The loss of «chaos» is the most important consequence of the change of the paradigm that will develop a creative impulse to the future science understanding. The process of interactions described in terms of $\langle E/I/M \rangle$ paradigm in which time is related to the (E/I) relationship and the space is described by the (I/M) correlations, can be seen as an evolutive process of the degree of the global system's quality. We observe an equivalent procedure when the software becomes incorporated into the hardware of computers, thus obtaining the evolution of computer generations. Likewise in nature, the progressive increase of embodied «information» into energy-matter transformation processes provide a good intuitive expression to interpret the evolution that creates during the natural evolution, the human brain.

Using formula (1), we can explain the main direction of evolutive process and hence his

line of reasoning permits us to argue that the Heisemberg uncertainty principle «is a consequence of the ignorance of the consideration of the parameter "information" in the explanation of physical phenomena». In fact, if we do not consider the objective existence of information as a physical aspect of nature, it will be impossible to refer the scientific meaning to a general and complete objective interpretation of the global events that produce the evolutive processes in nature.

Reasoning in this way, we can develop the new paradigm $\langle E/I/M \rangle$ of general system science in which evolution of natural and educational systems follows the same way of increasing the information's qualified energy (E_i) . In our approach to the general system theory, the tendency to transform energy and matter to improve the degree of information exchange in nature is defined as creativity of the system evolution.

In conclusion, we can guess that, the selective processes considered by Darwin, and the creativity processes described within the $\langle E/I/M \rangle$ paradigm, are working as two complementary differentiated factors for the evolution of nature.